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## Thermal Analog Device Reduces Machining Errors

Thermal analog devices predict the thermal expansion and contraction of machine structures subjected to various heat inputs. These analog devices correct the positioning of machine tools to compensate for distortion of the machine frame, thereby avoiding deviation of the tool relative to the workpiece.

Thermal elements are constructed after identifying the heat sources and observing the machine frame response to the temperature variations. Each thermal element consists of a pair of concentric cylindrical sleeves with a central electrical heating coil. One sleeve is a high heat capacity, high thermal conductivity material such as metal; and the other sleeve is a low heat capacity, high thermal resistance material such as plastic foam. Adjusting the thickness of the sleeves gives the element the same thermal resistivity and heat capacity (RC) time constant as the frame or the affected portion of the frame.

A network of the analog devices thermally simulates the machine frame. Devices, which generate an electrical current proportional to the energy released by the error producing heat source, feed the electrical heating coil. Thus, the temperature of the thermal element core corresponds to the heat flow emanating from the source. Thermocouples or strain gauges predict the thermal response of the frame by the temperature or dimensional change of the thermal element inner sleeve. The outputs of these sensors control tool positioning.

## Note:

Requests for further information may be directed

to:

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## **Patent Status:**

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